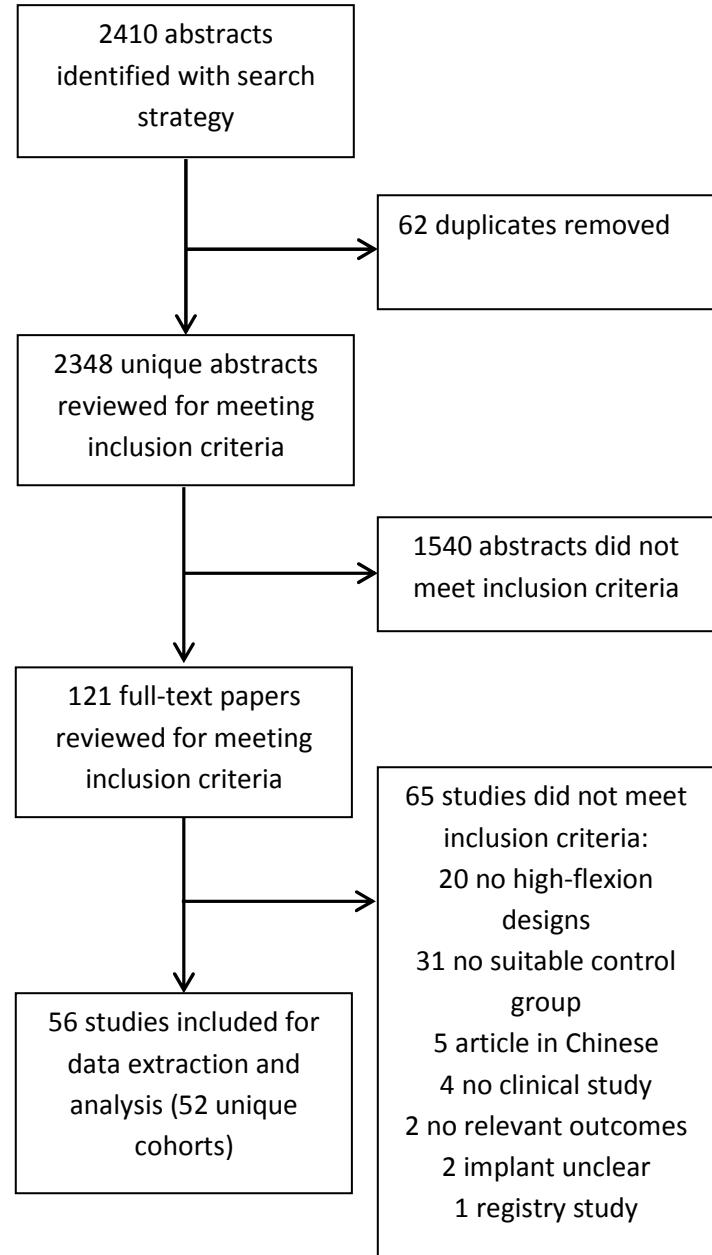


Appendix 5: High-flexion Total Knee Replacement (TKR)

- Flow diagram of included studies
- Study details 1 (aspects of internal validity)
- Study details 2 (aspects of external validity)
- Study reported outcomes
- Forest plots
- Funnel plots
- References



Study details I (aspects of internal validity)											
Study	Study design	Allocation method and concealment	Outcome blinding (surgeons/ patients/ assessors)	Prospective data collection and evaluation purpose	Sample size needs clearly defined (yes/no)	Primary Outcome specified?	Intention -to-treat analysis? (yes/no)	Consecutive patients series? (yes/no)	Group comparability assessed?	Controlling for confounding?	Procedure period
Ahmed, 2009, Nutton, 2008	Randomized controlled trial	Computer generated randomization using sealed envelopes before surgery	Assessor	Yes	No	Yes (F-E ROM)	Unclear	Unclear	Preoperative assessments	Randomized design	May 2004 – December 2005
Bajammal, 2006	Retrospective comparison of matched cohorts	Surgeon's preference	NA	Prospective outcome assessments, retrospective evaluation purpose	No	Yes (flexion)	NA	No	Demographics and preoperative assessments	Matching (gender and surgeon)	1998 – 2003
Biant, 2009, 2012	Randomized controlled trial	Randomization method unclear, concealment unclear	Unclear	Yes	No	Yes (flexion)	Unclear	Yes	Unclear	Randomized design	Unclear
Bin, 2007	Retrospective comparison of successive consecutive cohorts	Time period	NA	No	No	No	NA	Yes	Demographics and preoperative assessments	No	May 2002 – May 2004
Boese, 2011	Retrospective comparison of matched cohorts	Surgeon's preference	NA	No	Yes	Yes (F-E ROM, based on power calculation)	NA	No	Demographics and preoperative assessments	Matching (preoperative flexion, age, gender, weight)	December 2006 – January 2008
Choi, 2010	Randomized controlled trial	Computer generated randomization,	Unclear	Yes	Yes	Yes (F-E ROM, based on power	Yes	Yes	Demographics and preoperative	Randomized design	Unclear

			concealment unclear			calculation(assessments		
Coughlin, 2007	Retrospective comparison of selected non-consecutive cohorts	Surgeon's preference	NA	No	No	No	NA	No	Demographics and preoperative assessments	No	NA
Crow, 2010	Retrospective comparison of successive consecutive cohorts	Time period	NA	Prospective outcome assessments, retrospective evaluation purpose	No	Yes (F-E ROM)	NA	No	Demographics and preoperative assessments	No (despite group gender imbalance)	2004
Dennis, 2013	Randomized controlled trial in patients with bilateral TKR	Randomization method unclear ("based on preoperative passive flexion"), concealment unclear	Assessor	Yes	Yes, decreased based on interim second power analysis	Yes (passive flexion)	Unclear	Unclear	Demographics NA, preoperative assessments	Randomized design, patients served as own controls	March 2006 – August 2008
Endres, 2011	Retrospective comparison within consecutive cohort	Surgeon's preference	NA	No	No	No	NA	Yes	Demographics and preoperative assessments	No	January 2005 – January 2006
Fisher, 2013	Randomized controlled trial	Randomization by unclear method, concealment unclear	Unclear	Yes	Yes	Yes (F-E ROM, based on power calculation)	Unclear	Yes	Demographics and preoperative assessments	Randomized design	August 2010 – March 2011
Gobel, 2008	Prospective comparison of successive consecutive cohorts	Time period	NA	Prospective outcome assessments, retrospective evaluation purpose	No	No	NA	Yes	Unclear	No	January 2001 – March 2002
Guild, 2014	Randomized controlled trial	Randomization using sequential	Assessor	Yes	No	No	Unclear	Unclear	Demographics and	Randomized design	2002 - 2007

		pool of table of random numbers, concealment unclear								preoperative assessments		
Gupta, 2006	Retrospective comparison of matched cohorts	Surgeon's preference	No	Prospective outcome assessments, retrospective evaluation purpose	Yes	Yes (F-E ROM, based on power calculation)	NA	Yes (high-flexion cohort)	Demographics and preoperative assessments	Matching (age, sex, BMI, diagnosis, preoperative ROM)	July 2004 – March 2005	
Hamilton, 2011	Randomized controlled trial	Randomization by unclear method, concealment unclear	Patients	Yes	Yes	Yes (F-E ROM, based on power calculation)	Unclear	Unclear	Demographics and preoperative assessments	Randomized design	August 2007 – April 2009	
Huang, 2005	Retrospective comparison of non-consecutive matched cohorts	Surgeon's and/or patient' preference	NA	No	No	No	NA	No	Demographics and preoperative assessments	Matching (age, sex, weight, diagnosis, preoperative ROM)	March 2001 – July 2001	
Kim, 2005	Randomized controlled trial in patients with bilateral TKR	Unclear unit of randomization using sequential pool based on random number table, concealment unclear	Unclear	Yes	Yes	Yes (F-E ROM, based on power calculation)	Unclear	Yes	Demographics NA, preoperative assessments	Randomized design, patients served as own controls	July 2002 – September 2002	
Kim, 2009	Randomized controlled trial in patients with bilateral TKR	Randomization by unclear method, concealment using sealed envelopes opened before surgery	Assessor	Yes	Yes	Yes (F-E ROM, based on power calculation)	Unclear	Yes	Demographics NA, preoperative assessments	Randomized design, patients served as own controls	October 2004 – December 2004	
Kim, 2013 (A)	Retrospective comparison within non-	Unclear (surgeon's preference)	Unclear	No	No, retrospective power	Yes (maximum flexion,	NA	No	Demographics and preoperative	No	February 2005 – October	

	consecutive cohort			calculation	based on power calculation			assessments		2005
Kim, 2013 (B)	Randomized controlled trial in patients with bilateral TKR	Unclear unit of randomization using sequential pool based on random number table, concealment unclear	Assessors	Yes	Yes	Yes (F-E ROM, based on power calculation)	Unclear	Yes	Demographics NA, preoperative assessments	Randomized design, patients served as own controls
Klein, 2004	Prospective cohort with successive designs in same knee	NA (successive application in same knee)	Patients	Yes	No	Yes (F-E ROM)	No	Unclear	NA	Patients served as their own control September 2002 – January 2003
Kwak, 2012	Retrospective comparison of selected non-consecutive cohorts	Unclear (surgeon's preference)	Assessors	No	No	No	NA	No	Demographics and preoperative assessments	Febraruay 2006 – February 2007
Laskin, 2007	Retrospective comparison of successive consecutive cohorts	Time period	NA	No	No	Yes (F-E ROM)	NA	Yes	Demographics and preoperative assessments	14 month period
Lee, 2011	Retrospective comparison of selected non-consecutive cohorts	Surgeon's preference and time period, concealment unclear	NA	No	Yes	Yes (F-E ROM)	NA	No	Demographics and preoperative assessments	No (despite difference in preoperative assessment) 1999 – 2005
Lee, 2012	Retrospective comparison of successive consecutive cohorts	Time period	NA	No	No	No	No	Yes	Demographics and preoperative assessments	January 1999 – December 2004
Li, 2007	Retrospective comparison of	Surgeon's preference	NA	No	Yes	Unclear	NA	No	Preoperative assessments	No January 1999 –

	selected non-consecutive cohorts											December 2003
Lutzner, 2014	Randomized controlled trial	Randomization by unclear method, concealment unclear	Unclear	Yes	Yes	Yes (F-E ROM, based on power calculation)	Unclear	Yes	Demographics and preoperative assessments	Randomized design	March 2009 – September 2011	
Mai, 2013	Retrospective comparison of selected non-consecutive cohorts	Surgeon's preference	No	No	No	Yes	NA	Unclear	Demographics and preoperative assessments	No	NA	
Malik, 2010	Retrospective comparison of non-consecutive matched cohorts	Surgeon's preference	NA	No	Yes	Yes (F-E ROM, based on power calculation)	NA	No	Demographics and preoperative assessments	Matching (age, sex, BMI, preoperative ROM)	January 2006 – January 2008	
Massin, 2010	Retrospective comparison of successive consecutive cohorts	Time period	NA	Prospective outcome assessments, retrospective evaluation purpose	Yes	Yes (F-E ROM, based on power calculation)	NA	Yes	Demographics and preoperative assessments	No (despite between group age and sex difference)	June 2005 – June 2007	
McCalден, 2009	Randomized controlled trial	Randomization by unclear method, concealment unclear	Assessor	Yes	Yes	Yes (Maximum flexion, based on power calculation)	Unclear	Unclear	Demographics and preoperative assessments	Randomized design	Unclear	
McCalден, 2010	Retrospective comparison of selected non-consecutive cohorts	Surgeon's preference	NA	Prospective outcome assessments, retrospective evaluation purpose	No	Unclear	NA	No	Demographics and preoperative assessments	Mutivariable statistical analysis	1996 – NA	
Minoda, 2009	Retrospective comparison of	Time period	NA	No	No	Unclear	NA	Yes	Demographics and	No	July 2003 – July 2005	

	successive consecutive cohorts									preoperative assessments	
Minoda, 2010	Retrospective comparison of non-consecutive matched cohorts	Surgeon's preference	Assessor	Unclear	Yes	Yes (bone mineral density, based on power calculation)	NA	No	Demographics and preoperative assessments	Matching (age, sex, weight, height, diagnosis, time period)	June 2004 – September 2005
Nam, 2012	Retrospective comparison within non-consecutive cohort	Surgeon's preference	NA	No	No	Unclear	NA	No	Demographics and preoperative assessments	No	December 2006 – January 2010
Ng, 2008	Retrospective within patient comparison within non-consecutive cohort of bilateral TKRs	NA	NA	No	No	Yes (flexion)	NA	No	Demographics NA, preoperative assessments	Patients served as their own control	2002 – 2004
Nieuwenhuijse, 2013	Randomized controlled trial	Randomization by computer generated list, concealment unclear	Patients, assessors	Yes	Yes	Yes	Yes	Yes	Demographics and preoperative assessments	Randomized design	September 2002 – April 2005
Nutton, 2012	Randomized controlled trial	Randomization by computer-generated sequence using sealed envelopes opened just before surgery	Patients, assessors	Yes	Yes	Yes (F-E ROM, based on power calculation)	Unclear	Yes	Demographics and preoperative assessments	Randomized design	August 2007 – December 2009
Okamoto, 2011	Retrospective within patient comparison within non-consecutive cohort	Surgeon's preference	NA	Unclear	No	Unclear	NA	No	Demographics NA, preoperative assessments	Patients served as their own control	NA

Assessments and analyses											
		Allocation		Blinding		Outcomes		Demographics		Randomization	
		Method	Concealment	Patient	Assessor	Primary	Secondary	Demographic	Preoperative	Design	Date
Seng, 2011	Randomized controlled trial	Randomization by unclear method using sealed envelopes opened just before surgery	Patients, assessors	Yes	No	Yes (F-E ROM)	Unclear	Unclear	Demographics and preoperative assessments	Randomized design	November 2001-September 2003
Seon, 2005	Retrospective comparison within non-consecutive cohort	Surgeon's preference	NA	No	No	Yes (F-E ROM)	NA	No	Demographics and preoperative assessments	No	Unclear
Seon, 2009	Randomized controlled trial	Randomization procedure unclear, concealment using sealed envelopes opened 7-14 days before surgery	Unclear	Yes	Yes	Yes (F-E ROM, based on power calculation)	Unclear	Yes	Demographics and preoperative assessments	Randomized design	Unclear
Seon, 2013	Retrospective comparison of non-successive consecutive cohorts	'Sequential order of surgery', concealment unclear	Assessor	No	No	Yes (F-E ROM, based on retrospective power calculation)	NA	Yes	Yes (F-E ROM, based on power calculation)	No	2004 - 2006
Song, 2012	Prospective cohort with consecutive measurements	NA (successive application in same knee)	Patients	Yes	Yes	Yes (F-E ROM, based on power calculation)	NA	Unclear	NA	Patients served as their own control	April 2007 – July 2007
Stromont, 2009	Retrospective comparison of non-consecutive non-successive cohorts	Surgeon's preference	NA	Prospective outcome assessments, retrospective evaluation purpose	Yes	Yes (F-E ROM)	NA	No	Demographics and preoperative assessments	No	Unclear
Suggs,	Retrospective	Surgeon's	NA	No	No	No	NA	No	Demographics	No	NA

2009	comparison of non-consecutive selected cohorts	preference									
Thomsen, 2013	Randomized controlled trial in patients with bilateral TKR	Randomization of left knee prosthesis using computer generated list, concealment unclear	Patients, assessor	Yes	Yes	Yes (patient satisfaction based on power calculation)	Unclear	Unclear	Demographics NA, preoperative assessments	Patients served as their own control	February 2004 – September 2006
Tsai, 2009	Retrospective comparison of selected cohorts	Surgeon's preference	NA	No	No	Unclear	NA	No	Demographics and preoperative assessments	No (despite age and preoperative assessment differences)	April 2000 – January 2002
Tsui, 2011	Retrospective comparison of successive consecutive cohorts	Surgeon's preference	NA	No	No	Yes (F-E ROM)	NA	Yes	Demographics and preoperative assessments	No (despite between group difference in age, sex and diagnosis)	May 1998 – March 2004
Waisfisz, 2010	Retrospective comparison within consecutive cohort	Surgeon's preference	Patients	No	Yes	Yes (F-E ROM)	NA	Yes	Demographics and preoperative assessments	No	January 2006 – January 2007
Weeden, 2007	Randomized controlled trial	Randomization procedure unclear, concealment unclear	Unclear	Yes	No	Yes (F-E ROM)	NA	Unclear	Demographics and preoperative assessments	Randomized design	March 2002 - NA
Wohlrab, 2005, 2009, Radetzki, 2013	Randomized controlled trial	Randomization using 'randomized list', concealment unclear	Unclear	Yes	No	Unclear	NA	Unclear	Demographics and preoperative assessments	Randomized design	2000

Study	Study details II (aspects of external validity)										
	No. Of replacements (no. of patients)	Mean age (SD, range)	Female (%)	Osteo-arthritis (%)	Mean length of FU (yrs; SD, range)	Follow-up completion (%)	Prosthesis brands (new vs conventional)	Manufacturer	Site, surgeon	Hospital setting (designer/university/general)	Continent (country)
Ahmed, 2009, Nutton, 2008	56 (56)	NA	48.2	NA	1 (NA)	NA	NexGen MB LPS-flex versus NexGen MB LPS	Zimmer	NA, multiple surgeons	University	Europe (U.K.)
Bajammal, 2006	174 (174)	69.9 (7.2)	62.1	NA	1 (NA)	NA	Scorpio Flex PS versus Scorpio PS	Stryker	Single site, multiple surgeons	University	North America (Canada)
Biant, 2009, 2012	100 (100)	NA	NA	NA	0.5 (NA)	NA	Genesis II CR high-flexion insert versus Genesis II CR standard insert	Smith & Nephew	NA	NA	NA
Bin, 2007	180 (131)	66.5 (6.9)	95	100	1 (NA)	93.3	NexGen LPS-flex versus NexGen LPS	Zimmer	Single site, single surgeon	University	Asia (South Korea)
Boese, 2011	128 (128)	63.9 (NA)	57.8	100	1.4 (0.8-2.8)	NA	PFC Sigma RP-F (PS) versus PFC RP (PS)	DePuy	Single site, single surgeon	General	North America (U.S.)
Choi, 2010	170 (128)	70.6 (5.9, 56 – 86)	94.7	100	2.3 (2-NA)	88.2	PFC Sigma RP-F (PS) vs PFC Sigma (PS)	DePuy	Single site, single surgeon	University	Asia (South Korea)
Coughlin, 2007	22 (15)	NA (59-81)	NA	NA	3.0 (2.2)	NA	Scorpio Flex PS versus Scorpio PS	Stryker	Single site, single surgeon	University	North America (U.S.)
Crow, 2010	164 (144)	68.2 (8.8)	84.7	NA	1 (NA)	NA	Genesis II CR high-flexion insert versus Genesis II CR standard insert	Smith & Nephew	Single site, single surgeon	General	North America (U.S.)
Dennis, 2013	186 (93)	61.4 (44-73)	66	99	1 (NA)	92.5	PFC Sigma RP-F (PS) vs PFC Sigma RP (PS)	DePuy	Multiple site, multiple surgeons	University, general, designer	North America (U.S.)
Endres, 2011	107 (107)	66.2 (7.6)	63.6	100	5.7 (4.3-5.8)	NA	NexGen MB CR-Flex versus Genesis II MB CR	Zimmer and Smith & Nephew	Single site, single surgeon	General	Europe (Germany)
Fisher, 2013	60 (60)	70 (NA)	80	100	1 (NA)	98	PFC Sigma HF 150 (CR) vs PFC Sigma (CR)	DePuy	Single site, single surgeon	General	Europe (Germany)
Gobel, 2008	44 (44)	66.4 (NA)	29.5	NA	5 (NA)	NA	NexGen LPS-Flex versus	Zimmer	Multiple site,	General	Europe

								CKS CC CR		and Stratec Medical	multiple surgeon,		(Germany)
Guild, 2014	278 (278)	65 (43-80)	49.6	96.0	2 (NA)	83.5	NexGen LPS-flex versus NexGen LPS	Zimmer	Multiple site, multiple surgeon,	University, general	North America (U.S.)		
Gupta, 2006	100 (90)	67.8 (48- 89)	77.8	100	1 (0.5-2)	100	PFC Sigma RP-F (PS) versus PFC RP (PS)	DePuy	Single site, single surgeon	General	North America (U.S.)		
Hamilton, 2011	142 (142)	63.5	55.6	100	1.0 (0.8- 1.8)	90	PFC Sigma RP-F (PS) vs PFC Sigma (PS)	DePuy	Single site, multiple surgeons	General	North America (U.S.)		
Huang, 2005	50 (50)	69.2 (6.0)	86.0	100	2 (NA)	NA	NexGen LPS-flex versus NexGen LPS	Zimmer	Single site, single surgeon	University	Asia (Taiwan)		
Kim, 2005	100 (50)	68 (53-83)	96.0	98	2.1 (2.0- 2.2)	100	NexGen LPS-flex versus NexGen LPS	Zimmer	Single site, single surgeon	University	Asia (South Korea)		
Kim, 2009	118 (59)	69.7 (6.4)	83.1	NA	3.1 (3.0- 3.3)	91.5	NexGen CR-flex versus NexGen CR	Zimmer	Single site, single surgeon	University	Asia (South Korea)		
Kim, 2012 (A)	90 (65)	67 (52-79)	89.2	100	5.4 (5.0- 5.8)	100	PFC Sigma RP-F (PS) versus PFC RP (PS)	DePuy	Single site, single surgeon	University	Asia (South Korea)		
Kim, 2012 (B)	222 (111)	65 (48-85)	75	100	10.3 (10.- 10.6)	90	NexGen LPS-flex versus NexGen LPS	Zimmer	Single site, single surgeon	University	Asia (South Korea)		
Klein, 2004	74 (60)	66 (46-80)	66.7	100	0 (intra- operativ e only)	100	Scorpioflex PS versus Scorpie PS	Stryker	Single site, single surgeon	University	North America (U.S.)		
Kwak, 2012	111 (76)	68.7 (6.0, 52-86)	94.6	100	2.9 (2.0- 4.3)	100	PFC Sigma RP-F (PS) versus PFC RP (PS)	DePuy	NA, single surgeon	University, general	Asia (South Korea)		
Laskin, 2007	80 (80)	NA	57.5	100	2 (NA)	98.8	Genesis II PS High-flex versus Genesis II PS	Smith & Nephew	NA	University	North America (U.S.)		
Lee, 2011	80 (80)	65.5 (6.1)	100	100	NA (2- NA)	NA	NexGen LPS-flex versus NexGen LPS	Zimmer	NA	University	Asia (South Korea)		
Lee, 2012	137 (105)	67.4 (NA)	91	100	7.4 (5- 12)	100	Scorpioflex PS versus Scorpie PS	Stryker	NA, multiple surgeon	University, general	Asia (Korea)		
Li, 2007	55 (NA)	71, (7, 38- 87)	76	90.5	4.2 (1.0- 9.0)	85.5	NexGen LPS-flex versus NexGen LPS	Zimmer	Single site, single surgeon	University	Asia (Hong Kong)		
Lutzer, 2014	122 (122)	68.9 (8.7)	57.1	NA	NA (1.0- NA)	95.1	Scorpio NRG (CR) versus	Stryker	Single site, NA	University	Europe		

												(Germany)
Mai, 2013	144 (108)	70.4 (8.6)	61.9	92	NA)	2.7 (1.0-5.6)	100	Scorpie (CR) <i>Scorpio NRG/Triathlon/Genesis II (all CR) versus PFC Sigma/Natural Knee (all CR)</i>	Stryker, Smith& Nephew, DePuy, Zimmer	NA, multiple surgeons	General	North America (U.S.)
Malik, 2010	100 (50)	64.6 (10.3, 46-87)	76	99	1 (NA)	NA		Genesis II CR high-flexion insert <i>versus</i> Genesis II CR standard insert	Smith & Nephew	Single site, single surgeon	University	North America (U.S.)
Massin, 2010	124 (118)	72.5 (8.7)	61	NA	1 (NA)	NA		PFC Sigma RP-F (PS) <i>versus</i> PFC RP (PS)	DePuy	Multiple site, multiple surgeons	University	Europe (France)
McCalден, 2009	100 (100)	71 (NA)	52	100	2.7 (2.3-3.1)	98		Genesis II PS High-flex <i>versus</i> Genesis II PS	Smith & Nephew	Single site, multiple surgeons	University	North America (Canada)
McCalден, 2010	1374 (1148)	67.5 (9.8)	58	91	NA (1-NA)	NA		Genesis II PS High-flex <i>versus</i> Genesis II PS	Smith & Nephew	Single site, multiple surgeons	University	North America (Canada)
Minoda, 2009	181 (171)	70.5 (8.5)	84.1	78.4	NA (1-NA)	94.3		NexGen CR-flex <i>versus</i> NexGen CR	Zimmer	Single site, single surgeon	General	Asia (Japan)
Minoda, 2010	56 (56)	72.9 (57-85)	78.6	92.8	2.0 (NA)	NA		NexGen LPS-Flex <i>versus</i> PFC Sigma RP	Zimmer and DePuy)	Single site, single surgeon	University	Asia (Japan)
Nam, 2012	50 (35)	68.0 (6.4)	97.3	100	2.6 (NA)	73.5		PFC Sigma RP-F <i>versus</i> LCS	DePuy	Single site, single surgeon	University	Asia (Korea)
Ng, 2008	72 (36)	68 (53-82)	80	100	2.9 (1.7-4.4)	NA		NexGen LPS-flex <i>versus</i> NexGen LPS	Zimmer	Multiple sites, multiple surgeons	University, general	Asia (Hong Kong)
Nieuwen-huijse, 2013	78 (74)	69.6 (11.0)	80.8	NA	NA (5-NA)	84.6		NexGen LPS-flex MB/FB <i>versus</i> NexGen LPS MB/FB	Zimmer	Single site, multiple surgeons	University	Europe (Netherlands)
Nutton, 2012	77 (77)	69 (45-85)	51.3	100	1.0 (0.9-1.1)	100		PFC Sigma RP-F (PS) <i>versus</i> PFC (CR)	Depuy	Single site, multiple surgeons	University	Europe (UK)
Okamoto, 2011	20 (10)	74 (NA)	40	100	5.0 (NA)	NA		Triathlon <i>versus</i> Duracon CR	Stryker	NA, single surgeon	University	North America (U.S.)

Seng, 2011	76 (76)	67.6	76.3	100	NA (5-NA)	82.9	NexGen LPS-Flex FB versus PFC modular knee system	Zimmer and DePuy	Multiple sites, multiple surgeons	University, general	Asia (Singapore and Malaysia)
Seon, 2005	100 (100)	66.6 (48-84)	91	100	NA (2-NA)	NA	NexGen LPS-flex FB versus e-motion MB	Zimmer and Braun-Aesculap	Single site, single surgeon	University	Asia (South Korea)
Seon, 2009	104 (104)	68.4 (50-85)	84	100	2.2 (2.0-2.6)	96.1	NexGen CR-flex FB versus NexGen CR FB	Zimmer	Single site, single surgeon	University	Asia (South Korea)
Seon, 2013	182 (182)	67.2 (65-70)	96.5	100	6.2 (5-8)	75.3	NexGen CR-flex/LPS-Flex (FB) versus NexGen CR FB	Zimmer	Single center, single surgeon	University	Asia (South Korea)
Song, 2012	80 (40)	68.0 (52 - 81)	100	100	Intraoperative	NA	NexGen CR-Flex vs NexGen CR	Zimmer	Single center, single surgeon	University	Asia (South Korea)
Stormont, 2009	116 (104)	68.5 (10.5)	61.5	94.8	NA (1.0-NA)	NA	Vanguard versus Maxim	Biomet	Multiple sites, multiple surgeons	General	North America (U.S.)
Suggs, 2009	26 (24)	68.0 (10.9)	19.2	100	1.1 (0.5)	NA	NexGen CR-Flex vs NexGen CR	Zimmer	Single center, single surgeon	General	North America (U.S.)
Thomsen, 2013	72 (36)	67.2 (49-84)	57.6	97.2	NA (1-MA)	91.7	NexGen LPS-Flex vs AGC CR	Zimmer and Biomet	Single center, single surgeon	University	Europe (Denmark)
Tsai, 2009	26 (26)	69.5 (2.2)	NA	NA	NA (1-NA)	NA	Unspecified high-flexion TKR versus unspecified standard TKR	NA	NA	University	Asia (Taiwan)
Tsui, 2011	371 (336)	67.7 (26-94)	88.9	56.3	1.0 (0.9-1.1)	88.8	DKB Hi-flex versus DKB	Finsbury	NA, single surgeon	University, designer	Asia (Japan)
Waisfisz, 2010	46 (45)	74.8 (52-86.8)	78.3	NA	Intraoperative only	NA	NexGen LPS-flex versus NexGen LPS	Zimmer	NA, single surgeon	General	Europe (France)
Weeden, 2007	50 (50)	62.5 (51-82)	62	78	1.0 (NA)	100	NexGen LPS-flex versus NexGen LPS	Zimmer	NA	General	America (U.S.)
Wohlrab, 2005, 2009, Radetzki, 2013	60 (60)	66.0 (7.4)	56.7	100	10.8 (10-NA)	66.6	NexGen LPS-flex MB versus NexGen LPS MB	Zimmer	Single site, multiple surgeons	University	Europe (Germany)

Study	Quality	Outcome	Flexion–extension (mean, SD / range)		KSS (mean, SD / range)		KSS function (mean, SD / range)		HSS score (mean, SD / range)		Satisfaction (mean, percentage)	
			High-flexion	Standard	High-flexion	Standard	High-flexion	Standard	High-flexion	Standard	High-flexion	Standard
Ahmed, 2009, Nutton, 2008	Moderate	Preoperative	108 (15)	106 (15)	NA	NA	50.7 (15.9)	45.3 (15.4)	NA	NA	-	-
		Postoperative	110 (17)	107 (15)	NA	NA	76.9 (19.7)	84.3 (10.6)	NA	NA	NA	NA
Bajammal, 2006	Low to moderate	Preoperative	110.6 (13.0)	113.1 (10.6)	Done but NA	Done but NA	NA	NA	NA	NA	-	-
		Postoperative	113.6 (10.5)	113.5 (11.6)	92.3 (7.4)	90.5 (12)	NA	NA	NA	NA	NA	NA
Biant, 2009, 2012	Low	Preoperative	103.7 (NA)	105.4 (NA)	NA	NA	NA	NA	NA	NA	-	-
		Postoperative	106.0 (NA)	106.0 (NA)	NA	NA	NA	NA	NA	NA	NA	NA
Bin, 2007	Low	Preoperative	123.3 (13.1)	122.9 (17)	NA	NA	NA	NA	55.9 (8.6)	58.4 (14.2)	-	-
		Postoperative	129.8* (5.2)	124.3 (9.2)	NA	NA	NA	NA	92.9 (4.5)	92.5 (5.3)	NA	NA
Boese, 2011	Low	Preoperative	113.1	113.1	NA	NA	NA	NA	NA	NA	-	-
		Postoperative	114.7	116.4	NA	NA	NA	NA	NA	NA	4.4/5 (NA)	4.5/5 (NA)
Choi, 2010	High	Preoperative	126 (13.4, 80-145)	127 (14.5, 90- 150)	36 (17.2, 0-82)	37 (12.1, 7-88)	36 (15.5, 3-74)	38 (15.3, 18-89)	43 (13.3, 14-63)	47 (11.2, 29-84)	-	-
		Postoperative	128 (11.1, 95-150)	130 (10.4, 100-150)	94 (9.0, 73-100)	95 (6.9, 68-100)	91 (8.8, 66-100)	92 (7.7, 61-100)	92 (7.2, 68-100)	93 (5.9, 70-100)	0.91	0.91
Coughlin, 2007	Low	Preoperative	NA	NA	NA	NA	NA	NA	NA	NA	-	-
		Postoperative	128 (5, 120- 138)	129 (8, 106-135)	95(1.7)	96(5.2)	NA	NA	NA	NA	NA	NA

Crow, 2010	Low to moderate	Preoperative	114.2 (13.1)	111.6 (12.0)	54.8 (NA)	51.2 (NA)	47.2 (NA)	49.9 (NA)	NA	NA	-	-
		Postoperative	119.8* (9.3)	112.0 (11.1)	86.8 (NA)	87.4 (NA)	75.6 (NA)	80.7 (NA)	NA	NA	NA	NA
Dennis, 2013	Moderate to high	Preoperative	122.5 (11, 85-144)	122.8 (10.2, 90- 146)	47.4 (17.4, 13-100)	48.1 (19.0, 2- 100)	NA	NA	NA	NA	-	-
		Postoperative	127.8 (9.2, 90-145)	126.8 (9.8, 89- 142)	87.0 (10.7, 56-100)	85.6 (11.5, 54- 100)	NA	NA	NA	NA	NA	NA
Endres, 2011	Low	Preoperative	82 (6.5)	85 (8.1)	Done but NA	Done but NA	Done but NA	Done but NA	NA	NA	-	-
		Postoperative	122 (10.6)	120 (12.6)	Done but NA	Done but NA	Done but NA	Done but NA	NA	NA	NA	NA
Fisher, 2013	Moderate	Preoperative	99 (15)	103 (13)	25 (13)	20 (15)	NA	NA	NA	NA	-	-
		Postoperative	115 (11)	119 (12)	90 (10)	89 (13)	NA	NA	NA	NA	NA	NA
Gobel, 2008	Low	Preoperative	95 (NA)	90 (NA)	Done but NA	Done but NA	Done but NA	Done but NA	NA	NA	-	-
		Postoperative	115* (NA)	100 (NA)	Done but NA	Done but NA	Done but NA	Done but NA	NA	NA	4.5/5 (NA)	4.1/5 (NA)
Guild, 2014	Moderate	Preoperative	113.0 (11.2)	114.7 (11.0)	39.2 (15.5)	57.3 (16.0)	55.7 (18.8)	62.8 (18.4)	62.3 (10.5)	62.3 (10.3)	-	-
		Postoperative	120.9 (10.4)	121.0 (9.7)	87.7 (12.7)	85.6 (17.7)	83.0 (19.1)	88.9 (7.6)	87.3 (8.8)	NA	NA	
Gupta, 2006	Low to moderate	Preoperative	108 (60-130)	110 (70- 130)	56.9 (19- 79)	57.0 (18- 79)	54.4 (10- 95)	50.0 (30- 80)	NA	NA	-	-
		Postoperative	125* (105- 150)	116 (90- 130)	90.4 (77- 99)	95.0 (79- 99)	95.8 (55- 100)	93.0 (75- 100)	NA	NA	NA	NA
Hamilton,	Moderate	Preoperative	119.1 (NA)	120.3	Done but	Done but	Done but	Done but	NA	NA	-	-

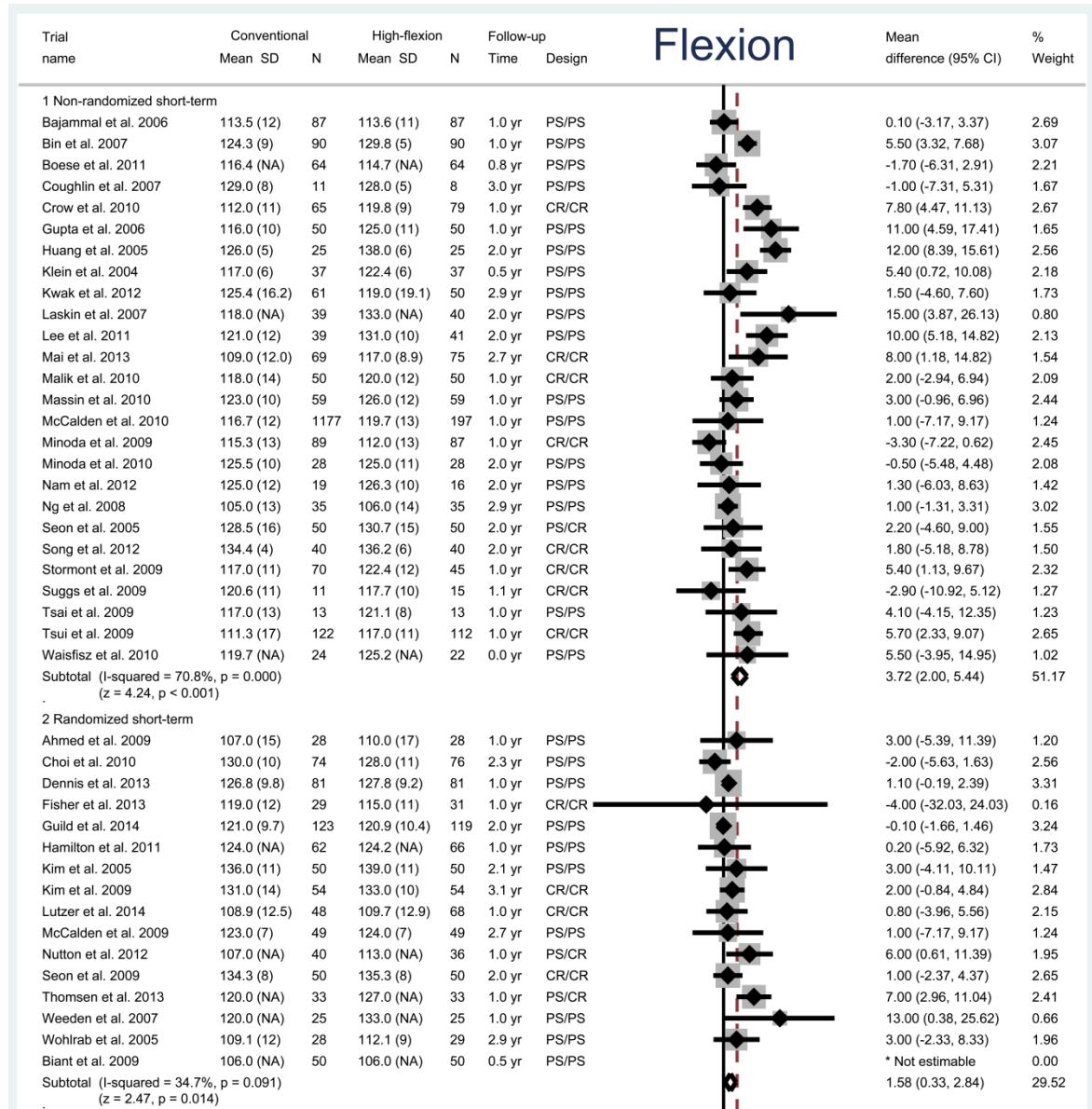
		Postoperative	106 (14)	105 (13)	NA	NA	NA	NA	NA	NA	NA
Nieuwenhuijs e, 2013	High	Preoperative	106.0 (15.2)	110.4 (15.4)	33.0 (11.4)	36.6 (15.7)	30.9 (23.0)	29.6 (22.2)	NA	NA	-
		Postoperative	116.2 (15.0)	118.5 (11.6)	83.8 (5.4)	82.3 (11.3)	59.4 (31.9)	65.2 (34.5)	NA	NA	NA
Nutton, 2012	High	Preoperative	114 (110-118)	113 (109- 117)	NA	NA	NA	NA	NA	-	-
		Postoperative	113 * (109-117)	107 (104- 110)	73.9 (68.4- 79.4)	78.5 (71.1- 81.9)	80.8 (74.2- 87.4)	80.6 (74.2- 87.4)	NA	NA	NA
Okamoto, 2011	Low	Preoperative	Done but NA	Done but NA	Done but NA	Done but NA	Done but NA	Done but NA	NA	NA	-
		Postoperative	120 (9)	119 (13)	Done but NA	Done but NA	Done but NA	Done but NA	NA	NA	NA
Seng, 2011	Moderate to high	Preoperative	123 (23)	122 (12)	42(17)	42(18)	48(17)	48(19)	NA	NA	-
		Postoperative	128* (12)	117 (14)	84 (12)	87 (10)	69 (30)	62 (31)	NA	NA	NA
Seon, 2005	Low	Preoperative	127.5 (90- 155)	127.4 (85-160)	NA	NA	NA	NA	46.7 (20- 68)	48.1 (22- 70)	-
		Postoperative	130.7 (95- 155)	128.5 (95-160)	NA	NA	NA	NA	92.8 (71- 100)	90.7 (77- 100)	NA
Seon, 2009	Moderate to high	Preoperative	124.1 (16.1)	125.9 (17.7)	NA	NA	NA	NA	64.1 (7.1)	61.3 (10.6)	-
		Postoperative	135.3 (8.2)	134.3 (8.4)	NA	NA	NA	NA	94.4 (6.5)	92.4 (6.2)	NA
Seon, 2013	Low to moderate	Preoperative	132.5 (129- 135)	132.1 (130- 135)	NA	NA	21.3 (18-26)	20.1 (17-24)	NA	NA	-

Weeden, 2007	Moderate	Preoperative	122	121	44 (22-68)	46 (21-66)	NA	NA	NA	NA	-	-
		Postoperative	133*	120	93 (70-100)	92 (68-100)	NA	NA	NA	NA	NA	NA

Wohlrab, 2005, 2009, Radetzki, 2013	Moderate	Preoperative	108.5 (14.8)	105.7 (17.8)	NA	NA	NA	NA	54.4 (6.3)	48.6 (8.5)	-	-
		Postoperative	114.8 (10.1)	114.1 (9.4)	NA	NA	NA	NA	90.8 (8.6)	90.7 (5.8)	NA	NA

NA = not available (not applicable or not provided), * significant difference * Data based on most recent reports

Forest plot for flexion (in degrees) after short-term (intra-operative – 3.1 years), mid-term (4.2 – 7.4 years) and long-term (10.3 years) follow-up



3 Non-randomized mid-term

Endres et al. 2011	120.0 (13)	50	122.0 (11)	57	5.7 yr	CR/CR
Gobel et al. 2008	100.0 (NA)	22	115.0 (NA)	22	5.0 yr	PS/CR
Kim et al. 2012 (A)	125.0 (7.0)	45	135.0 (6.0)	45	5.4 yr	PS/PS
Lee et al. 2012	121.0 (11.4)	40	120.0 (16.1)	94	7.4 yr	PS/PS
Okamoto et al. 2011	119.0 (13)	10	120.0 (9)	10	5.0 yr	CR/CR
Seon et al. 2013	135.6 (7.0)	48	134.5 (8.1)	89	6.2 yr	CR/CR
Li et al. 2007	109.5 (NA)	40	104.3 (NA)	15	4.2 yr	PS/PS
Subtotal (I-squared = 84.4%, p = 0.000) (z = 1.46, p = 0.145)						

2.00 (-2.39, 6.39) 2.28
15.00 (9.71, 20.29) 1.98
10.00 (0.63, 19.37) 1.03
-1.00 (-6.51, 4.51) 1.91
1.00 (-14.39, 16.39) 0.47
-1.10 (-3.82, 1.62) 2.88
* Not estimable 0.00
4.24 (-1.46, 9.94) 10.55

4 Randomized mid-term

Nieuwenhuijse et al. 2013	118.5 (11.6)	24	116.2 (15.0)	28	5.0 yr	PS/PS
Seng et al. 2011	117.0 (14)	27	128.0 (12)	36	5.0 yr	PS/PS
Wohlrab et al. 2009	117.5 (10)	19	116.7 (10)	22	5.0 yr	PS/PS
Subtotal (I-squared = 76.0%, p = 0.016) (z = 0.82, p = 0.410)						

-2.30 (-9.75, 5.15) 1.39
11.00 (4.57, 17.43) 1.64
0.80 (-5.26, 6.86) 1.75
3.28 (-4.52, 11.08) 4.78

5 Randomized long-term

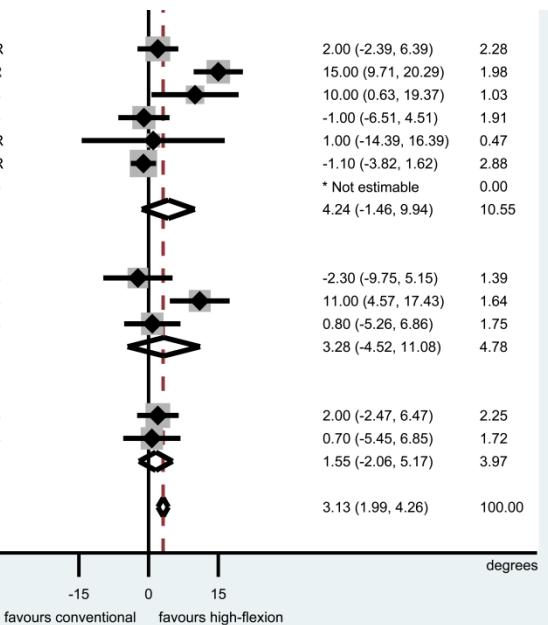
Kim et al. 2012 (B)	133.0 (NA)	100	135.0 (NA)	100	10.3 yr	PS/PS
Radetzki et al. 2013	114.1 (9.4)	22	114.8 (10.1)	17	10.8 yr	PS/PS
Subtotal (I-squared = 0.0%, p = 0.738) (z = .84, p = 0.400)						

2.00 (-2.47, 6.47) 2.25
0.70 (-5.45, 6.85) 1.72
1.55 (-2.06, 5.17) 3.97

Overall (I-squared = 69.6%, p = 0.000)
(z = 5.39, p < 0.001)

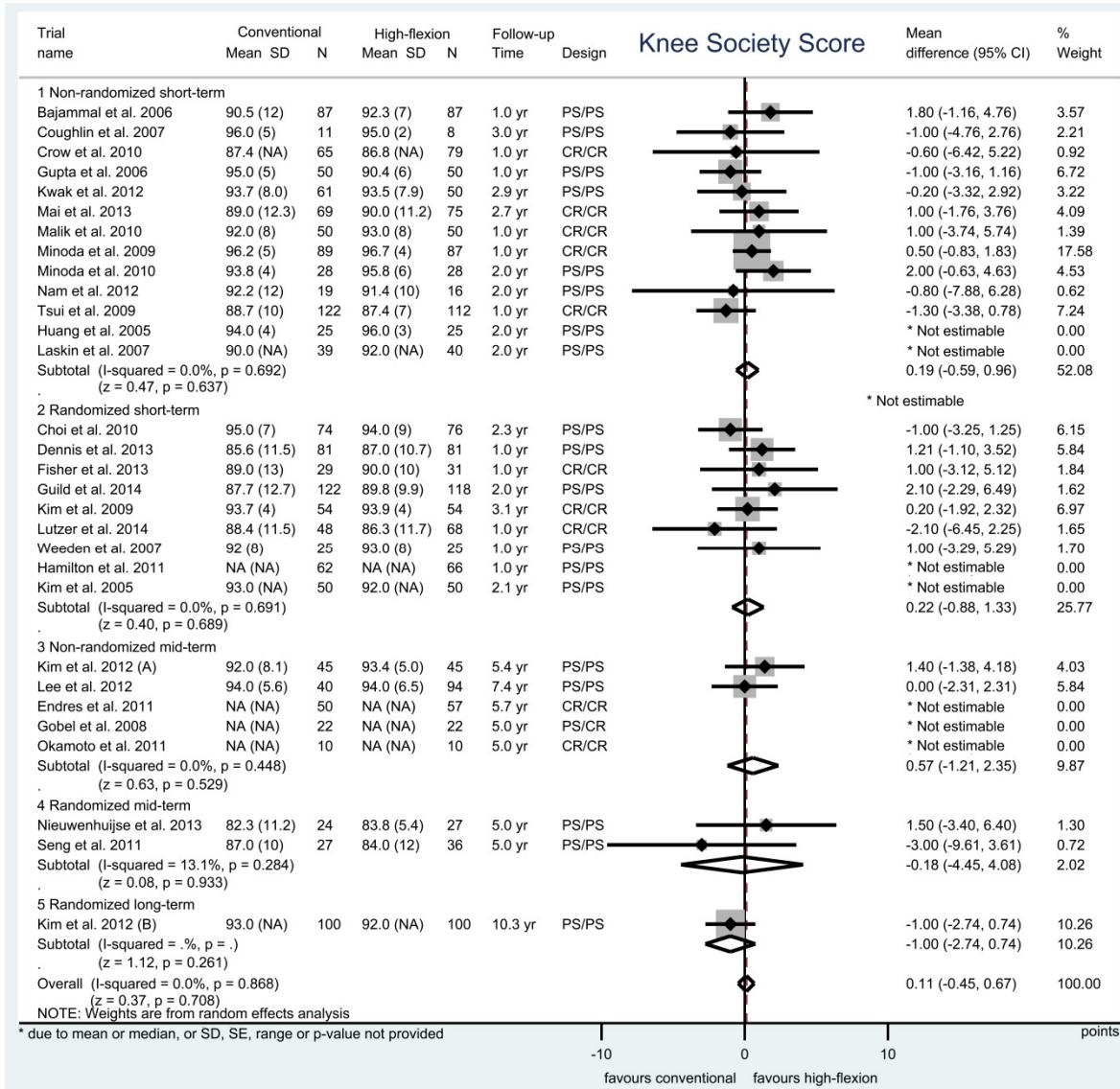
NOTE: Weights are from random effects analysis

* due to no mean or median, or SD, SE, range or p-value provided

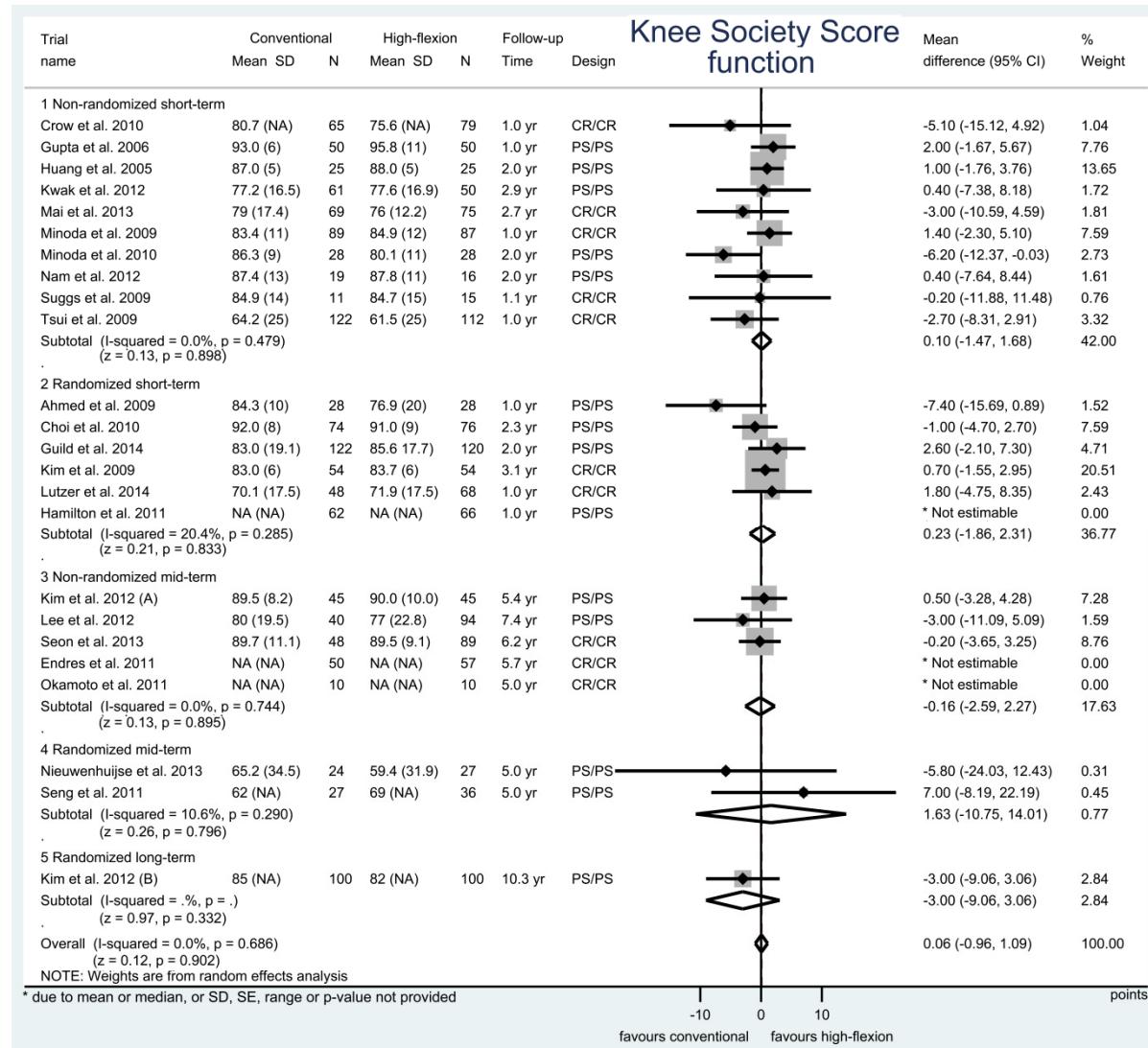


degrees
-15 0 15
favours conventional favours high-flexion

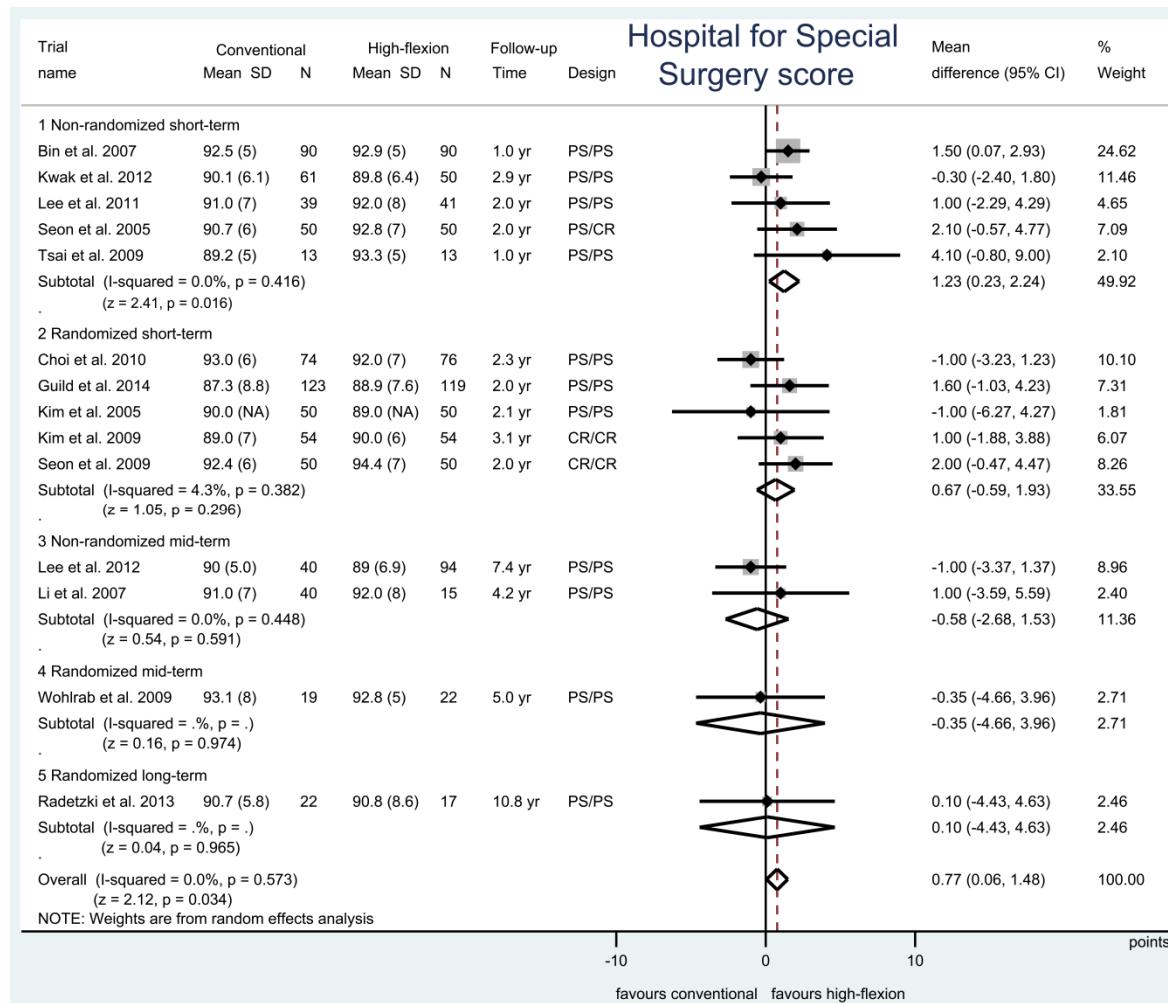
Forest plot for Knee Society Score (in points) after short-term (1.0 – 3.1 years), mid-term (5.0 – 7.4 years) and long-term (10.3 years) follow-up



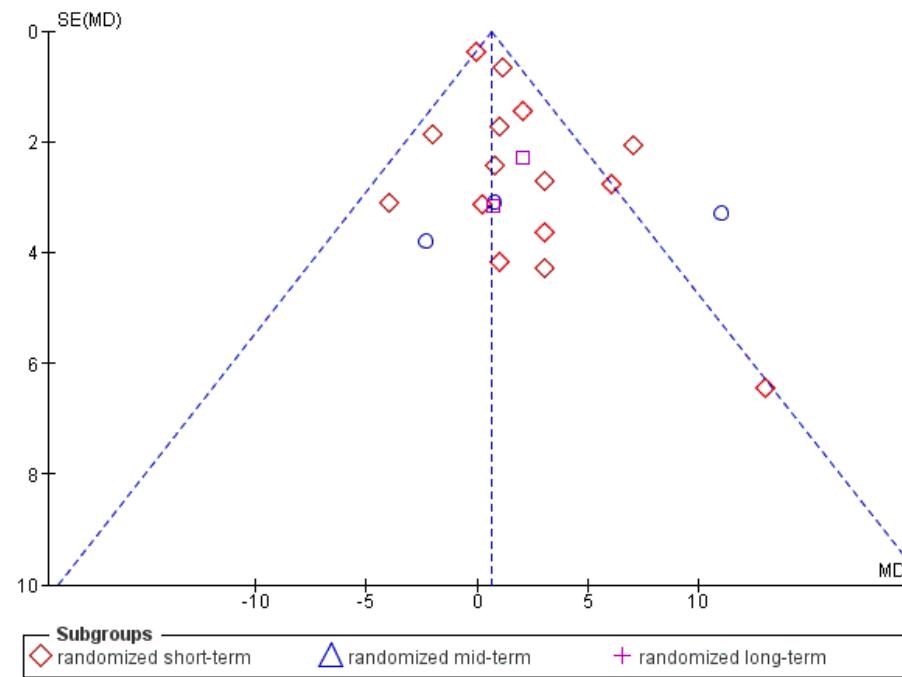
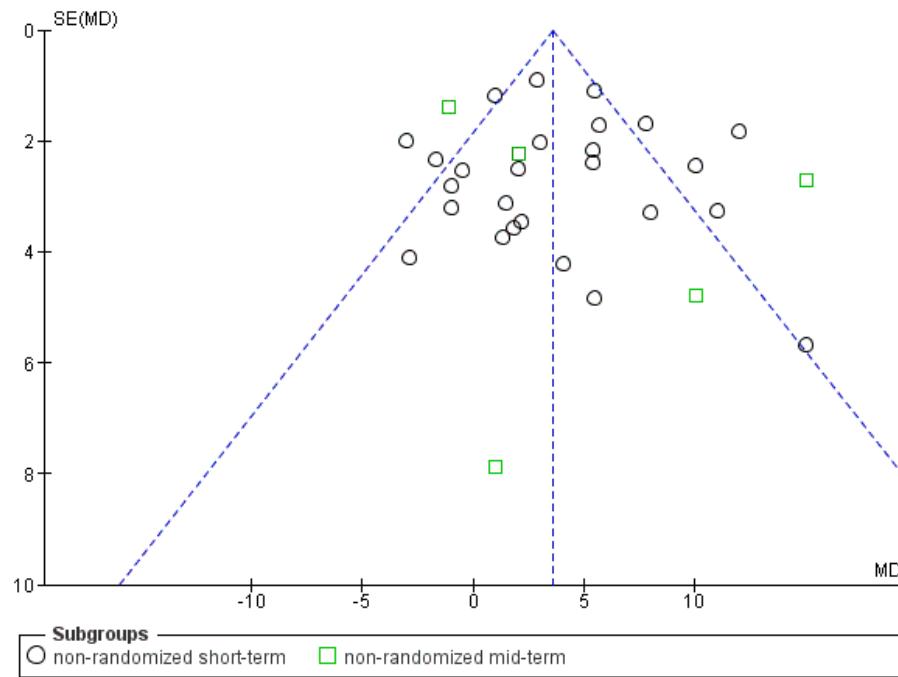
Forest plot for Knee Society Score function (in points) after short-term (1.0 – 3.1 years), mid-term (5.0 – 7.4 years) and long-term (10.3 years) follow-up



Forest plot for Hospital for Special Surgery score (in points) after short-term (1.0 – 3.1 years) and mid-term (4.2 – 7.4 years) and long-term (10.8 years) follow-up



Funnel plot for all 52 study cohorts (non-randomized left, randomized right)



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